



**South Carolina State Ports
Authority – Continuous Air
Monitoring Station for the Wando
Welch Terminal**

Q3 2013 Quarterly Report

October 2013



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Wando Welch Terminal**

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1. Introduction

1.1 Scope

ARCADIS U.S., Inc. (ARCADIS) was contracted in late December 2010 to provide Continuous Air Monitoring Services to the South Carolina State Ports Authority (SCSPA) at the Wando Welch Terminal in Mt. Pleasant, SC. ARCADIS has followed through on the planned schedule and activities since that award. The major accomplishments were to complete the Quality Assurance Plan (QAP), purchase the instruments, complete the site setup, and then to begin acquiring data. This report is the tenth quarterly data report (second quarterly report in year three of operations) and presents the data summaries requested by SCSPA and described in the work scope. The data acquisition was started on May 6, 2011 in line with the court mandated start date. This report encompasses a period corresponding to data taken during the period from July 1, 2013 through September 30, 2013.

1.2 Project Description

SCSPA requested a system to provide ambient air quality data including particulate matter less than 2.5 microns ($PM_{2.5}$), SO_2 , and NO_2 for a period of 5 years at the Wando Welch Terminal of the port of Charleston. ARCADIS will maintain the monitoring instruments, stock consumables such as filters and calibration gases, and order spare parts such that downtime will be minimized. ARCADIS has established standard operating procedures to perform daily downloads and to provide Level 1 data validation for the resulting data. This monitoring project setup was relatively straightforward and has proven to be reliable and is generating valid high quality data suitable for use in dispersion modeling or other potential purposes.

The QAP is updated periodically to reflect improvements to the basic operating procedures or to document changes in the air quality standards. An update was performed on September 20, 2012, following the annual maintenance program and an on-site audit by the S.C. Department of Health and Environmental Control (conducted June 14-15, 2012) to reflect actual procedures at the end of the first year of operation. An update was also performed on October 17, 2013, to reflect changes to the National Ambient Air Quality Standards (NAAQS) for $PM_{2.5}$. This QAP is written consistent with the current ambient air quality standards for PM, NO_x and SO_2 as defined by the U.S. Environmental Protection Agency. Excursions beyond these standards have not been observed, but a few daily spikes and rises have been noted and correlating local

conditions are investigated in local media outlets and recorded when seen. These observations are tabulated and presented in the quarterly reports.

The location selected for sampling and the sampling equipment has proven to be well-suited for the project as it is centrally located to the port activities and has proven to be very responsive to local equipment air emissions and the local meteorological conditions. Although this is not a typical fence line site, it has shown high value in permitting the evaluation of port activities and related air quality effects. ARCADIS has been able to remotely access the control computer and reliably interact with the instruments. The instruments are very responsive to events such as container handling equipment and the morning openings of the front gates to entering truck traffic. These patterns can be reviewed in the archived data any time in the future.



2. Quarterly Results

The 24-hr daily averages for PM_{2.5}, NO, NO₂, NO_x, and SO₂ and the maximum daily value (1-hr average) for NO₂ and SO₂ for this period are shown in Table 2-1. No exceedances were indicated this quarter. Quarterly statistics showing averages, minimums and maximums for all parameters are summarized in Table 2-2, with the corresponding NAAQS shown in Table 2-3. 24-hr averages for all constituents are also shown graphically in Figure 2-1. Maximum 1-hr averages for NO₂ and SO₂ are shown in Figure 2-2. Statistics are broken down by months and summarized in Table 2-4.

Table 2-1. 24-Hour Averages

Date	24-hour Averages					Daily Max 1-hr Avg.	
	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
7/1/13	8.03	12.62	5.72	18.16	0.00	19.50	0.11
7/2/13	10.02	19.36	5.14	24.09	0.01	17.38	0.23
7/3/13	6.36	15.96	3.98	19.26	0.03	18.05	0.48
7/4/13	7.82	0.03	0.00	0.00	0.08	0.00	1.80
7/5/13	3.31	6.62	0.70	6.27	0.08	3.61	1.59
7/6/13	3.79	0.10	0.00	0.01	0.06	0.03	1.42
7/7/13	5.32	0.18	0.02	0.05	0.05	0.54	1.05
7/8/13	6.40	11.60	2.53	13.65	0.05	11.59	0.93
7/9/13	5.77	10.57	2.31	12.38	0.05	9.44	1.02
7/10/13	4.76	15.23	3.55	18.22	0.04	15.24	0.84
7/11/13	7.28	6.33	4.44	10.59	0.18	11.94	2.31
7/12/13	4.82	8.88	6.77	15.58	0.10	24.75	1.11
7/13/13	5.59	0.52	0.22	0.56	0.12	2.82	2.76
7/14/13	5.71	0.13	0.03	0.05	0.07	0.37	1.64
7/15/13	5.48	2.35	0.39	2.05	0.08	3.53	1.78
7/16/13	9.08	5.99	0.99	6.39	0.05	5.55	1.24
7/17/13	7.32	7.82	4.77	12.48	0.56	18.51	4.02
7/18/13	6.24	10.22	5.56	15.58	0.19	18.03	1.59
7/19/13	6.23	8.13	2.60	10.27	0.03	9.57	0.72
7/20/13	5.56	0.63	1.84	2.42	0.20	6.32	2.26
7/21/13	9.42	2.17	3.29	5.41	0.50	8.85	4.50
7/22/13	8.14	5.45	5.95	11.35	1.02	12.02	2.60



Date	24-hour Averages					Daily Max 1-hr Avg.	
	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
7/23/13	9.30	4.88	9.05	13.91	1.91	15.77	7.56
7/24/13	12.23	9.70	14.09	23.78	1.63	25.13	8.56
7/25/13	16.97	5.22	9.73	14.93	0.35	17.68	3.22
7/26/13	9.01	1.56	4.52	6.04	0.04	13.06	0.86
7/27/13	4.56	0.06	1.29	1.25	0.03	3.54	0.81
7/28/13	11.60	0.78	3.57	4.29	0.21	12.02	1.45
7/29/13	12.85	7.47	11.16	18.57	0.12	28.62	1.32
7/30/13	9.27	3.67	6.39	10.03	0.23	17.49	2.38
7/31/13	14.45	7.34	12.80	20.12	0.70	36.09	5.41
8/1/13	9.48	8.56	10.38	18.93	0.92	19.38	5.67
8/2/13	9.79	7.81	8.59	16.39	0.45	19.40	4.24
8/3/13	6.38	0.08	1.37	1.40	0.03	2.91	0.73
8/4/13	14.53	3.57	5.70	9.26	2.72	16.49	7.35
8/5/13	7.37	1.78	4.80	6.56	0.02	12.23	0.55
8/6/13	9.66	5.67	7.02	12.67	0.00	23.99	0.10
8/7/13	4.61	2.85	5.56	8.38	0.01	21.17	0.16
8/8/13	9.88	8.28	8.80	17.05	0.12	21.43	1.04
8/9/13	5.91	10.33	4.02	14.24	0.11	13.73	1.35
8/10/13	6.73	0.93	1.57	2.47	0.07	6.31	0.88
8/11/13	6.82	0.68	0.92	1.59	0.18	5.69	1.57
8/12/13	14.80	5.86	6.87	12.72	1.06	16.31	3.54
8/13/13	15.18	6.44	7.55	13.98	0.99	20.32	11.59
8/14/13	8.96	4.33	7.72	12.04	0.62	17.15	3.72
8/15/13	5.80	2.87	5.98	8.83	0.18	14.70	4.10
8/16/13	8.40	2.62	3.87	6.48	0.10	15.48	2.32
8/17/13	10.02	1.98	2.36	4.28	0.58	10.31	4.63
8/18/13	7.43	0.49	0.63	0.98	0.19	4.16	2.78
8/19/13	6.23	14.73	5.91	20.49	0.13	15.21	2.46
8/20/13	3.20	8.74	3.40	12.01	0.15	10.65	3.29
8/21/13	4.98	10.94	4.74	15.58	0.13	15.87	2.84
8/22/13	3.24	10.51	6.96	17.44	0.55	16.94	4.05
8/23/13	6.83	5.51	6.79	12.29	0.46	13.74	4.85



Date	24-hour Averages					Daily Max 1-hr Avg.	
	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
8/24/13	11.32	1.46	1.76	3.19	0.24	7.95	3.23
8/25/13	8.26	0.20	1.54	1.73	0.02	6.06	0.51
8/26/13	7.47	1.75	4.80	6.54	0.04	10.44	0.68
8/27/13	6.69	6.85	10.92	17.77	0.19	26.89	2.29
8/28/13	11.88	5.36	9.56	14.92	0.86	20.56	6.11
8/29/13	16.82	5.98	14.32	20.30	2.84	30.89	14.23
8/30/13	10.73	1.49	5.22	6.70	0.05	15.03	1.17
8/31/13	7.23	0.50	2.33	2.82	0.17	5.86	1.78
9/1/13	10.87	0.58	3.62	4.17	0.23	16.07	1.45
9/2/13	8.91	0.20	1.47	1.61	0.10	6.56	0.85
9/3/13	10.53	4.61	8.12	12.70	1.38	20.34	7.12
9/4/13	14.43	7.63	14.58	22.21	1.30	29.62	4.46
9/5/13	15.22	8.12	15.81	23.92	1.55	30.48	7.02
9/6/13	14.23	1.48	8.19	9.66	0.48	16.64	2.22
9/7/13	11.08	0.07	1.93	1.97	0.06	4.43	0.89
9/8/13	11.77	0.47	3.80	4.23	0.40	10.35	3.07
9/9/13	12.18	6.78	9.68	16.44	0.12	25.73	0.69
9/10/13	10.64	2.45	7.37	9.80	0.05	16.58	0.72
9/11/13	8.27	2.06	5.19	7.23	0.05	12.23	0.97
9/12/13	9.55	5.60	9.05	14.64	0.94	32.22	5.35
9/13/13	11.88	3.97	9.54	13.50	0.58	16.74	3.80
9/14/13	11.36	0.28	3.08	3.32	0.14	18.42	1.62
9/15/13	8.27	0.03	1.10	1.05	0.04	1.66	0.86
9/16/13	12.94	10.01	12.35	22.33	0.47	27.78	3.69
9/17/13	8.15	1.42	5.23	6.63	0.14	9.91	1.74
9/18/13	5.87	1.78	5.62	7.36	0.05	11.63	0.60
9/19/13	6.70	4.34	8.85	13.18	0.04	15.89	0.21
9/20/13	9.40	4.24	8.99	13.23	0.12	27.97	0.74
9/21/13	4.09	0.41	2.74	3.13	0.07	8.55	0.82
9/22/13	5.09	1.13	3.86	4.96	0.72	19.17	4.13
9/23/13	9.73	3.20	7.15	10.32	0.07	18.57	0.69
9/24/13	9.64	2.35	7.28	9.62	0.06	18.25	0.36



24-hour Averages						Daily Max 1-hr Avg.	
Date	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
9/25/13	10.17	2.09	6.67	8.73	0.06	18.01	0.84
9/26/13	9.46	2.38	6.13	8.49	0.07	14.05	1.24
9/27/13	5.11	1.88	5.23	7.09	0.05	9.90	0.52
9/28/13	5.38	0.39	2.08	2.45	0.07	5.60	1.00
9/29/13	3.46	0.23	2.31	2.51	0.05	10.87	0.66
9/30/13	7.50	5.09	11.11	16.20	0.08	25.67	1.19

Table 2-2. Quarterly Statistics

24-hour Averages						Daily Max 1-hr Avg.	
Date	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
Average	8.60	4.63	5.47	10.00	0.35	14.61	2.51
Minimum	3.20	0.03	0.00	0.00	0.00	0.00	0.10
Maximum	16.97	19.36	15.81	24.09	2.84	36.09	14.23

Table 2-3. National Ambient Air Quality Standards

Pollutant	Primary Standard		Secondary Standard	
	Level	Averaging Time	Level	Averaging Time
NO ₂	53 ppb ⁽¹⁾	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour ⁽²⁾	None	
SO ₂	75 ppb	1-hour ⁽³⁾	0.5 ppm	3-hour ⁽⁴⁾
PM _{2.5}	12.0 µg/m ³	Annual ⁽⁵⁾ (Arithmetic Average)	15.0 µg/m ³	Annual ⁽⁵⁾ (Arithmetic Average)
	35 µg/m ³	24-hour ⁽⁶⁾	Same as Primary	

⁽¹⁾ The official level of the annual NO₂ standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

⁽²⁾ To attain this standard, the 3-year average of the 98th percentile (8th highest in a year) of the daily maximum 1-hour average at each monitor within the area must not exceed 100 ppb.



⁽³⁾ Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile (4th highest in a year) of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

⁽⁴⁾ Not to be exceeded more than once per year.

⁽⁵⁾ To attain this standard, the 3-year average of the weighted annual mean PM_{2.5} concentrations from a single or multiple community-oriented monitors must not exceed 12.0 ug/m³ (primary standard) or 15.0 ug/m³ (secondary standard) (revised December 14, 2012).

⁽⁶⁾ To attain this standard, the 3-year average of the 98th percentile (8th highest in a year) of 24-hour concentrations at each population oriented monitor within an area must not exceed 35 ug/m³.

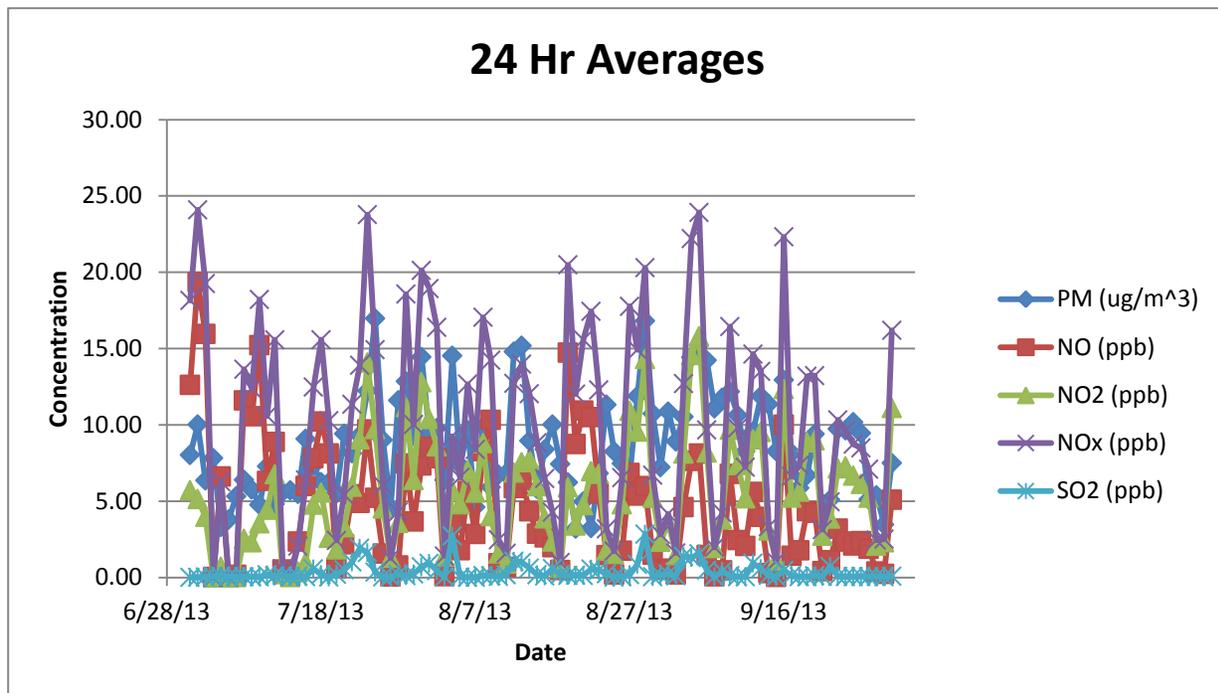


Figure 2-1. 24-hour Averages

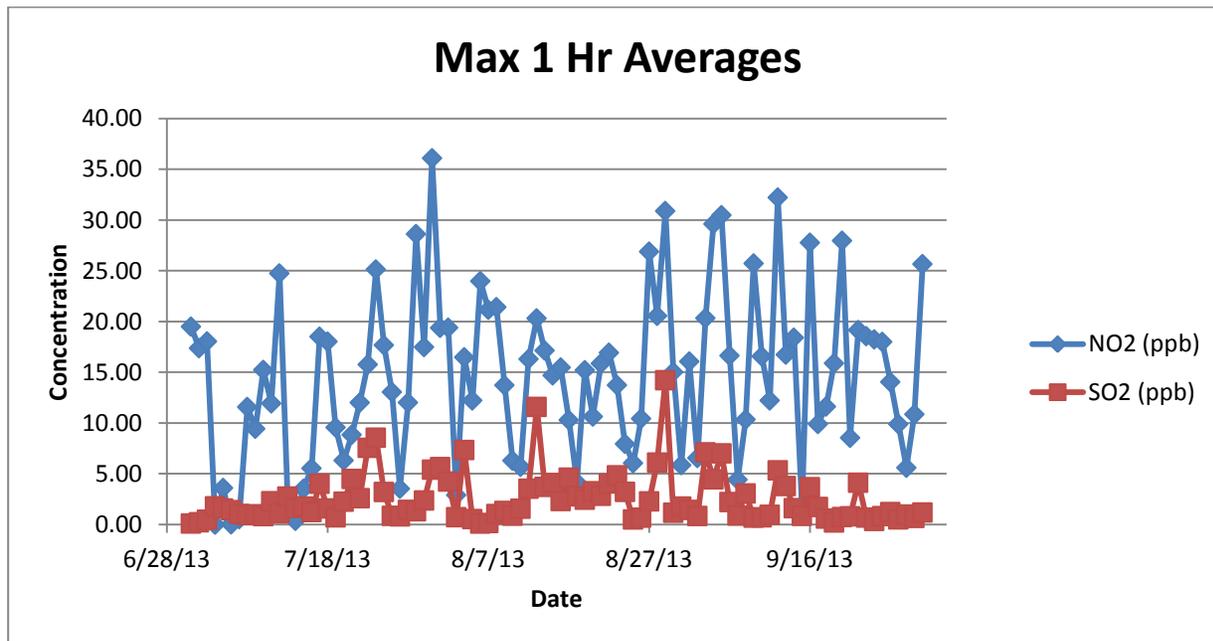


Figure 2-2. Max 1-hour Averages

Table 2-4. Monthly Statistics

Month	Monthly Averages					Monthly Daily Max 1-hr Avg.	
	PM _{2.5} (µg/m ³)	NO (ppb)	NO ₂ (ppb)	NO _x (ppb)	SO ₂ (ppb)	NO ₂ (ppb)	SO ₂ (ppb)
July 2013	7.83	6.18	4.30	10.25	0.28	12.49	2.18
August 2013	8.60	4.81	5.55	10.32	0.46	14.75	3.35
September 2013	9.40	2.84	6.60	9.42	0.32	16.66	1.98

2.1 Specific Data Notes

Normal maintenance and instrument calibration procedures were performed several times this quarter. Additional notes can be found in the QA/QC Daily Comment Sheet summary shown in Table 3-1.



3. Quality Assurance/Quality Control

QA/QC procedures applied to this project are described in a Quality Assurance Plan titled *Continuous Air Monitoring Station for the Wando Welch Terminal* (October 17, 2013, Revision 3).

3.1 Daily QC/Validation

According to the QAP prepared for this work, results were reviewed for anomalies and validated on a daily basis. These validations are recorded on QA/QC Daily Comment Sheets and are summarized in Table 3-1. This table contains a description of any anomalies that occurred over the past quarter along with a record of normal calibration and maintenance activities and the date of occurrence.

Table 3-1. QA/QC Daily Comment Sheet

Date	Comment
7/1/2013	Insufficient data 2:00 - 4:00 due to SO ₂ calibration.
7/2/2013	Insufficient data 2:00 - 4:00 due to SO ₂ calibration.
7/3/2013	Insufficient data 2:00 - 4:00 due to SO ₂ calibration.
7/20/2013	Insufficient data 4:00 - 6:00 due to NO _x calibration.
8/4/2013	Insufficient data 4:00 - 6:00 due to NO _x calibration.
8/11/2013	Insufficient data issue from 10:00 - 18:00 fixed by removing "1999" timestamped data from H05 file and running daily macro again.
8/12/2013	Insufficient data 4:00 - 6:00 due to NO _x calibration.
8/25/2013	Insufficient data 4:00 - 6:00 due to NO _x calibration.
8/26/2013	PAC Runtime was not running upon remote login. Restarted at 11:15. Resulted in insufficient data from 9:00 - 11:00.
9/6/2013	Insufficient data 2:00 - 4:00 due to SO ₂ calibration.
9/19/2013	Insufficient data 4:00 - 6:00 due to NO _x calibration.

3.2 Quarterly Data Validation

The quarterly data were assessed as follows: 100% of the validated Quarter 3 data were flagged as "good". Percent completeness for Quarter 2 was calculated by



dividing the number of hours flagged by the macro as “Insufficient Data” for any parameter by the total number of hours in the quarter. Percent completeness for Quarter 2 was 99.09%.